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Specification

Printing Blanket Assembly for a Blanket Cylinder and Method for Producing Said Printing Blanket Assembly

The invention relates to a printing blanket unit for a printing blanket cylinder, as well as methods for producing a printing blanket unit in accordance with the preambles of claims 1, 24, 31 or 42.

Printing blanket units are fastened on the printing blanket cylinder of printing presses and are used in offset printing for transferring the print image from the forme cylinder to the web of material to be imprinted. For providing the required mechanical strength for the printing blanket unit, a support platemade, for example, of sheet steel or sheet aluminum, is employed. A printing blanket which can be designed in the manner of a rubber blanket, for example, is fastened on the outside of the support plate. Folded legs, free of the printing blanket, are provided at the leading end and/or the trailing end of the support plate for fixing the printing blanket unit in place on the printing blanket cylinder. These legs can then be inserted, for example, into a slit provided in the printing blanket cylinder and fixed in place there.

A problem in connection with known printing blanket units is that the printing blanket does not enclose the support plate seamlessly, and that instead a gap remains between the leading and the trailing ends of the printing blanket. No printing ink can be transferred in the gap to the web of material to be imprinted. Furthermore, the print image is of reduced quality at the edges of the printing

blanket in the direction toward the gap. Therefore several solutions are known in the prior art, by means of which the disadvantages caused by the gap between the ends of the printing blanket can be avoided.

A printing blanket unit is known from DE 195 47 917 A1, wherein the two ends of the printing blanket overlap each other with a positive connection in order to reduce the gap between the ends of the printing blanket.

A printing blanket unit is known from DE 195 21 645 A1, wherein a slide is arranged between the two legs of the support plate. In this case the outward pointing end of the slide is connected with a filler element, so that the gap between the ends of the printing blanket is closed by the filler element.

A printing blanket unit is known from DE 195 43 584 C1, wherein the printing blanket is put together from a plurality of layers. Here, the top layer covers the front areas of the layers underneath it and in this way forms a protrusion, by means of which the gap at the ends is reduced.

USP 5,749,298 discloses a printing blanket unit with a support plate, whose ends are folded. The printing blanket arranged on the support plate is sealed at the front.

USP 4,635,550 discloses a printing blanket unit with a printing blanket arranged on a support plate. A support element is arranged in the groove in the support plate, which supports the projecting end of the printing blanket.

USP 2,525,003 shows a device for producing a printing blanket unit.

USP 4,643,093 discloses a printing plate with a reinforced end and an associated device.

The object of the invention is based on producing a printing blanket unit for a printing blanket cylinder, as well as methods for producing a printing blanket unit.

In accordance with the invention,this object is attained by means of the characteristics of claims 1, 24, 31 or 42.

An advantage of the printing unit in accordance with the invention lies in particular in that the inside of the leading and/or trailing end protrudes some distance past the fold of the associated leg. The gap between the ends of the printing blanket is reduced by means of this protrusion. It is easily conceivable here to select the protrusion to be so large that in the installed position the two ends of the printing blanket come into contact with each other. Because of the fold in the support plate, the protruding ends of the printing blanket are not supported from below by the support plate, so that no pressure between the printing blanket and the web of material to be imprinted could be built up in the area of the protruding ends without further assistance. To solve this problem it is proposed to arrange a support element between the fold of the support plate and the inside of the printing blanket for supporting the protrusion. As a result, the pressure forces are then transferred to the support plate via the support element, so that the printed image can be perfectly printed on the web of material to be imprinted in the area of the protruding ends of the printing blanket. It is basically without importance whether a support element for supporting the protrusion is provided at both ends of the printing blanket or only at one end of the printing blanket.

A multitude of fastening solutions is conceivable for fastening the support elements on the printing blanket unit. In accordance with a preferred embodiment, the support elements are fastened on the fold and/or the inside of the printing blanket by a material-to-material contact, in particular glued on or applied by vulcanization.

The support elements can be produced particularly simply if they are made of the same material as the printing blanket, for example of rubber, or of the same material as the support plate, for example of metal. It is then conceivable in particular to form the support elements as one piece on the printing blanket or the support plate.

When producing the support elements it is moreover conceivable for the support elements to be connected by a material-to-material contact with a sub-structure layer arranged between the printing blanket and the support plate, which in this way continuously envelops the support plate, starting at the two folds. By means of the sub-structure layer it is possible to additionally affect the properties of the printing blanket unit, in particular in respect to hardness and true running. Rubber or a similar elastomeric material in particular are suitable as the material for producing the sub-structure layer.

Printing blanket units which have a minimal gap can be produced in a simple way by using the production method in accordance with the invention. A processing cylinder can be available for performing the method, whose shape, in particular whose diameter and whose fastening devices for fastening the support plate, substantially correspond to the printing blanket cylinder later used in the printing press.

The not yet layered support plate is fastened on this processing cylinder by means of the folded legs and in this way takes up a position which corresponds to the subsequent position following the mounting on the printing blanket cylinder.

Following the fastening of the support plate on the processing cylinder, the gap between the oppositely located folds of the support plate is filled with a support material, for example a curable rubber material. The two folds of the support plate are connected by material-to-material contact in this way.

Following this, the printing blanket is fastened on the support plate in such a way, for example glued on or applied by vulcanization, that one end of the printing blanket protrudes some distance past the fold of the associated leg. In this way the protrusion then rests on the support material and is supported from below by the support material.

For being able to take the printing blanket unit off the processing cylinder, the support material is cut to form two support elements prior to or after fastening the printing blanket on the support plate. This can take place for example, in that the support material is cut through by means of a sharp cutting instrument. In this way the two lateral faces of the oppositely located support elements formed by the separating process have a shape wherein, following the mounting of the printing blanket unit on the printing blanket cylinder, the support elements of a complementary shape are located at a short distance opposite each other or come into contact with each other.

A preferred method variation is employed for not only to be able to assure the optimal support of the protrusion at the end of the printing blanket, but also to minimize, or eliminate, the gap between the two ends of the printing blanket. With this method variation the customary printing blankets are used which, prior to the application of the printing blanket to the support plate, have a flat shape, for example a rectangular shape. By applying the printing blanket to the support plate, a gap between the facing lateral faces at the oppositely located ends of the printing blanket is formed when employing these flat printing blankets. This gap is filled with a suitable sealing material, for example a curable rubber material. For being able to remove the printing blanket unit from the processing cylinder, the sealing material is then cut through after it has been sufficiently cured. The lateral faces of the oppositely located support elements formed by the cutting process thus have a shape wherein, following the mounting of the printing blanket unit on the printing blanket cylinder, the ends of the printing blanket of a complementary shape are located at a short distance opposite each other or come into contact with each other.

For achieving the best possible true running it is particularly advantageous if the sealing material is shaped, for example ground, prior to or after being cut for forming a cylindrical circumferential surface.

Preferably the sealing material and the support material are cut simultaneously in order to assure an optimal positive connection between the oppositely located ends of

the printing blanket unit when mounting the printing blanket unit on the printing blanket cylinder.

Alternatively to the use of flat printing blankets, the use of hose-like printing blankets is also conceivable. Because of their hose-like shape, with these printing blankets the connection of the ends is omitted, such as is required in connection with the preferred method variation for flat printing blankets for eliminating the gap between the ends of the printing blanket. For example, for fastening the hose-like printing blankets it is conceivable that, following the arrangement of the printing blanket on the support plate, a suitable adhesive is pressed into the gap between the printing blanket and the support plate. Channels or recesses in the support plate can be provided for this. Alternatively to this, the use of adhesive materials which can be cured by means of the temperature or light radiation is also conceivable, so that the hose-like printing blanket can initially be pulled onto the support plate and thereafter the adhesive applied to the support plate is cured by temperature or light radiation. As soon as the hose-like printing blanket has been fixed in place on the support plate, it can be cut by means of a suitable cutting process in order to be able to remove the support plate from the processing cylinder.

Exemplary embodiments of the invention are represented in the drawings and will be described in what follows.

Shown are in:

Fig. 1, a first embodiment of a printing blanket unit in a first production phase,

Fig. 2, the printing blanket unit in accordance with Fig. 1 in a second production phase,

Fig. 3, the printing blanket unit in accordance with Fig. 1 and Fig. 2 in a third production phase,

Fig. 4, a second embodiment of a printing blanket unit,

Fig. 5, a third embodiment of a printing blanket unit in partial cross section,

Figs. 6 and 7, exemplary embodiments of a production method for a printing blanket unit,

Fig. 8, an exemplary embodiment of the printing blanket unit in accordance with Fig. 7 with thickened ends,

Figs. 9 to 11, exemplary embodiments of a further production method for a printing blanket unit,

Fig. 12, an exemplary embodiment of the printing blanket unit in accordance with Fig. 3 with thickened ends.

The printing blanket unit represented in Fig. 1 to Fig. 12, whose thickness d01 is, for example, 1.6 mm, consists of a dimensionally stable support plate 02, 18, 42 of a thickness d02 of approximately 0.2 mm to 0.5 mm, and of a printing blanket 03, 19, 43, fastened on the support plate 02, 18, 42. The support plate 02, 18, 42 is made of metal, for example sheet steel or sheet aluminum. The printing blanket 03, 19, 43 can be embodied for example in the manner of a rubber blanket 03, 19, 43, in particular from several layers of different materials.

The legs 04, 06, 21, 22, 44, 46, which are free of the printing blanket, are folded downward at the leading and at the trailing end of the support plate 02, 18, 42 in a folding machine, so that the legs 04, 06, 21, 22, 44, 46 can later be used for fastening the printing blanket unit on a printing

blanket cylinder 09. The folded leg 06, 21, 46 at the leading end, together with the center element 07, 35, 47 of the support plate 02, 18, 42 following it, forms an acute opening angle α06, in particular of 30 to 60 degrees, preferably of 40 to 50 degrees. The folded leg 04, 22, 44 at the trailing end, together with the adjoining support plate 02, 18, 42, has an opening angle α04 of 45 to 15 degrees, in particular of 80 to 100 degrees. In a preferred exemplary embodiment the angle size is 120 to 150 degrees. The center element 07, 35, 47 of the support plate 02, 18, 42, which is completely covered by the printing blanket 03, 19, 43 toward the outside, extends between the legs 04, 06, 21, 22, 44, 46. The folds 08, 09, 27, 28, 48, 49 extend at the transition between the center element 07, 35, 47 on the one side and the legs 04, 22, 44, or 06, 21, 46 on the other side.

In the production phase represented in Fig. 1, the support plate 06, as well as the printing blanket 03, are designed approximately flat, so that the printing blanket 03 can be fastened on the support plate 02 free of tension and deformation. To this end, the printing blanket 03 can be glued on and/or vulcanized on.

Thereafter the legs 04 and 06, which are free of the printing blanket, are folded downward in a folding machine (Fig. 2).

The folds 08 and 09 are produced in the folding machine in such a way that the two ends 11 and 12 of the printing blanket 03 protrude some distance past the folds 08 and 09. The space between the protruding ends 11 and 12 of the printing blanket 03 on the one hand, and the support plate 02 on the other, is filled by a filler material 13, 14, also

called support element 13 and 14. The filler material 13 and 14 can be produced by applying a curable rubber material, for example.

The filler material 13, 14 is preferably deformable and/or flowable when being applied.

A portion of the printing fabric unit is shown in the installed position in Fig. 3. It can be seen that in the installed position the two legs 04 and 06 extend opposite and parallel to each other, so that they can be fastened together in a slit in a printing cylinder, not represented. Because of the protrusion of the ends 11 and 12 of the printing blanket 03, the width of the gap 16 between the ends 11 and 12 of the printing blanket 03 is minimized. Because of this it is possible, for example, to minimize the width of the gap 16 to a width of less than 0.5 mm.

The distance between the folds 08, 09 substantially corresponds to the distance a01 of the opening in the cylinder surface and is less than 3 mm, in particular it is less than 2.0 mm.

Because of the support of the protruding ends 11 and 12 by the filler material 13 and 14, a sufficient print transfer from the printing blanket 03 to a web of material to be imprinted is achieved in this area.

As represented in Fig. 4, the distance a02 between the oppositely located ends 11, 12 of the printing blanket 03 is 0.2 mm to 0.8 mm, preferably 0.3 mm to 0.7 mm. In a particularly preferred embodiment, the distance a02 is 0.4 mm to 0.6 mm, in particular 0.5 mm.

The fold 08 of the leg 04 has a radius R of 0.6 mm to 1.2 mm, in particular of 0.8 mm.

But the fold 09 of the leg 06 has a radius R of 0.3 mm to 0.7 mm, in particular of 0.5 mm.

The length L13, L14 of the respective support element 13, 14 in the circumferential direction is 0.4 mm to 1.0 mm, in particular 0.1 mm to 1.3 mm. In a preferred embodiment, the length L13, L14 of the support element 13, 14 is 0.7 mm.

As represented in Fig. 4, the filler material 13, 14 can be formed in different shapes. For example, the filler material 13 has an acute angle, while the filler material 14 is shaped right-angled.

The measurements described for Fig. 4 can be substantially transferred to all embodiments represented in the drawing figures.

A third embodiment of a printing blanket unit is represented in Fig. 5. This printing blanket unit also has a support plate 18 of sheet steel and a printing blanket 19 of rubber. For producing the printing blanket unit, first the support plate 18 is fastened by means of its legs 21 and 22 on a processing cylinder, whose shape corresponds to the printing blanket cylinder on which the printing blanket unit is to be fastened in the printing press. Following this, a sealing element 23 is inserted into the gap 26 between the legs 21 and 22 for sealing the gap 26 at the bottom. Thereafter a liquid elastomer material is applied to the outside of the support plate 18 in such a way that the support plate 18 is enclosed in a continuous sub-structure layer 24. In the area of the oppositely located legs 21 and 22, the sub-structure layer 24 fills the gap 26 between the oppositely located folds 27 and 28.

Subsequently the printing blanket 19 is fastened on the sub-structure layer 24, for example applied by vulcanization. The gap 26, which continues between the ends 31 and 32 of the printing blanket 19, is closed by filler material, here also called sealing material 19, for example a curable elastomeric material, and is thereafter ground at the outside for producing a uniform cylindrical outer surface.

At the end, the sealing material 19 and the sub-structure layer 24 are cut through along the cutting line 33, so that the printing blanket unit can be removed from the processing cylinder and mounted on a printing blanket cylinder. Separate support elements 34 and 36 are formed by means of the separation of the sub-structure layer 24, which respectively support the ends 31 and 32 of the printing blanket 19 from below. In the course of mounting the printing blanket unit on a printing blanket cylinder, the lateral faces of the support elements 34 and 36, which were created by the cut along the cutting line 33, can come into a positively connected contact with each other.

Figs. 6 to 8 show exemplary embodiments of a different production method for a printing blanket unit similar to the one in Fig. 3.

As already described, at least one end of the support plate 42 is folded. The support plate 42 is now placed on a base body 53 of a device 41 with at least one slide 54, 56, which will be described in what follows. At least one of the slides 54, 56 is movable in respect to the base body 53 and/or to the other slide 56, 54. The geometry of this base body 53 is matched to the geometry of the support plate 42. Both slides 54, 56 of the device 41 are open. Now the

support plate 42 is adjusted to the required cylinder circumference or the required folding measure by means of an adjustment mechanism 57. Both slides 54, 56 are closed. Thereafter, the filler material 51, 52 is subsequently poured or pressed in in a positively connected manner. Depending on the shape of the slides 54, 56, a flat sub-structure, i.e. one flush with the support plate 42, or a raised sub-structure is achieved, wherein the slides 54, 56 act as molds 54, 56 for the filler material 51, 52. In this case at least one of the filler materials 51, 52 protrudes in the radial direction past the virtual extension V42 of the exterior of the support plate 42. Now the filler material 51, 52 is pulled or ground to be flush by means of a further device 58. Subsequently the printing blanket 43 is applied to the filler material 51, 52. This can be performed with the aid of a stop 59, which can be placed against it. At the end, the slides 54, 56 are opened and the printing blanket unit is vulcanized. This vulcanization can be performed inside the device 41, but also outside of the device 41.

Figs. 9 and 10 show a particularly preferred production method for a further printing blanket unit. This embodiment makes it possible to close or to reinforce a groove of a cylinder.

Here, the filler material 51, 52 extends in a virtual extension V43 of the exterior of the printing blanket 43 in the longitudinal direction, i.e. the circumferential direction of the printing blanket 43. In this case the filler material 51, 52 can protrude in the longitudinal direction past one end 61, 62, as well as past both ends 61, 62 of the printing blanket 43. In the radial direction, the

filler material 51, 52 can protrude at least partially past the virtual extension V43 of the exterior of the printing blanket 43 (Figs. 10 and 11).

This embodiment is achieved by means of the following production method. As already described, at least one end of the support plate is folded. Thereafter, the printing blanket 43 is applied to the support plate 42. In this case it is unimportant whether or not the printing blanket 43 had already been vulcanized. Subsequently the slides 54, 56 are closed. Now the filler material 51, 52 for closing and reinforcing a groove is pressed or poured in. Depending on how the slide 54, 56 is designed, a corresponding shape of the filler material 51, 52 is achieved. Thereafter the filler material 51, 52 is shaped to the exact size. Depending on the needs, the vulcanization process can take place subsequently inside or outside of the device 41.

The two last mentioned production methods thus differ in that in the embodiments in accordance with Figs. 6 to 8 the filler material 51, 52 is arranged between the support plate 42 and the printing blanket 43, wherein the filler material 51, 52 is first arranged on the support plate 42 and then the printing blanket 43, while in the embodiments in accordance with Figs. 9 to 11 the support plate 42 is connected with the printing blanket 43, and the filler material 51, 52 is then introduced, wherein an exterior of the filler material 51, 52 which is arranged on the exterior in the radial direction is not covered by the printing blanket 43.

As represented in Figs. 8, 11 and 12, the printing blanket unit has at least one end of a greater thickness than

the area located between the two ends, so that the outer surface of the printing blanket unit in the area of this end protrudes at least partially past the virtual extension V43 of the exterior of the printing blanket 43 and in particular is embodied in a wedge shape. For thickening the end, the filler material 51, 52 is arranged at the ends of the printing blanket 43. In Figs. 8 and 12 an undercoating of the printing blanket at 43 can be seen, while in Fig. 11 a filling of the printing blanket 43 is represented.

The embodiment with thickened ends in Fig 8 in the state where it is mounted on the cylinder correspondingly also applies to Fig. 11.

In the state where they are mounted on the printing blanket cylinder, this thickened end or both thickened ends extend in the radial direction past a virtual extension of the adjoining rubber blanket, i.e. the effective radius of the mounted rubber blanket is greater in the area of the ends. The area located inbetween is very much larger (at least ten times) than the area of the ends. The thickening preferably extends in the circumferential direction by less than 10 mm, in particular less than 5 mm.

Accordingly, in the state mounted on the printing blanket cylinder, a radius R11, R12 (Fig. 12) of the cylinder in relation to the exterior of the printing blanket 03, or in relation to the outside of the filler material 13, 14 is greater, at least in the area of an end of the printing blanket unit, than a radius R03 of the cylinder in relation to the exterior of the printing blanket in the area between the two ends.

It applies to all methods that the filler material 13, 14, 29, 51, 52 is introduced in a flowable, deformable state at least to one end of the two ends of the printing blanket unit. The filler material 13, 14, 29, 51, 52 is arranged in the longitudinal direction at least partially on a fold 08, 09, 27, 28, 48, 49 of the folded leg 04, 06, 21, 22, 44, 46 of the support plate 03, 18, 42 and protrudes in the circumferential direction past the fold 08, 09, 27, 28, 48, 49. After application, the outside of the filler material 13, 14, 29, 51, 52 can be shaped to the exact size. Preferably the filler material 13, 14, 29, 51, 52 can be embodied as one piece. The materials of the printing blanket 03, 04 and of the filler material 13, 14, 29, 51, 52 can be identical or designed to be different.

As represented in Fig. 10, in a particularly preferred embodiment the length L51, L52 of the filler material 51, 52 is more than 0.1 mm, in particular more than 0.4 mm, however, less than 2 mm, in particular less than 5 mm.

For producing printing blanket units, with printing blanket units which lie stretched out, preferably flat or slightly arched, the filler material 51, 52, or the support elements 13, 14 is introduced at ends of the printing blanket unit facing away from each other (except for the exemplary embodiment of Fig. 5).

A device 41 of several parts can be employed for producing the printing blanket unit, wherein at least two elements, for example slides 54, 56, are movable in relation to each other. In connection with this it is possible, for example for producing thickened ends of the printing blanket unit, that at least the surface resting against the filler

material 51, 52 protrudes in the direction of the exterior of the printing blanket unit at least partially past the virtual extension V43 of the exterior of the printing blanket 43, or that at least the surface resting against the filler material 51, 52 protrudes in the direction of the exterior of the printing blanket unit at least partially past the virtual extension V42 of the exterior of the support plate 42 with the printing blanket 43 not yet applied to the support plate 42. The spacing between the two elements, for example slides 54, 56, should be adjustable in the longitudinal direction of the printing blanket unit. At least one surface of one of the two elements rests against the filler material 51, 52, and at least one surface can rest against a folded leg 44, 46 of the support plate 42. At least the surface resting against the filler material 51, 52 can protrude in the direction of the exterior of the printing blanket unit at least partially past the virtual extension V43 of the exterior of the printing blanket 43, or at least the surface resting against the filler material 51, 52 can protrude in the direction of the exterior of the printing blanket unit at least partially past the virtual extension V42 of the exterior of the support plate 42 with the printing blanket 43 not yet applied to the support plate 42. At least one other device 58, for example a tool 58 for processing at least the outside of the filler material 51, 52, can be arranged on the device 41.

At least one support 53, for example the base body 53, should be arranged in the device 41 for receiving the support plate 42, wherein the inside of the support plate 42 rests on this support 53.

The support 53 can consist of several elements. At least one element of the support 53 works together with a leading leg 46 of the support plate 42, another element of the support 53 with the trailing leg 44 of the support plate 42.

Preferably one element of the support 53 can change its position in respect to the other element of the support 53.

The device 41 can also have elements for folding the ends of the support plate 42, i.e. it can be embodied as a folding machine.

Embodiments wherein the support plate has only one folded leg are not represented. In these cases, the filler material can be arranged on the fold of the leg and on the other, non-folded end of the support plate.

The second end of the printing blanket unit is then not arranged in any groove, instead only on the exterior of the barrel of the printing blanket cylinder.

It applies to all described printing blanket units and methods, that the filler material 13, 14, 34, 36, 51, 52 is arranged, or can be arranged on the printing blanket unit, prior to mounting the printing blanket unit on the printing blanket cylinder.

It applies to all described printing blanket units and methods, that the filler material 13, 14, 34, 36, 51, 52 is arranged, or can be arranged on the printing blanket unit, prior to mounting the printing blanket unit on the printing blanket cylinder.

The filler material 13, 14, 34, 36, 51, 52, also identified as support elements 13, 14, 34, 36, 51, 52, can, for example, also be used for supporting a counter-cylinder

in the radial direction, because the printing blanket cylinder is in contact with a counter-cylinder, for example a forme or a plate cylinder. The forme cylinder has at least one groove, in which the at least one printing plate is fastened. In this case the filler material 13, 14, 34, 36, 51, 52 works together with a printing plate of the counter-cylinder in that they mutually support each other.

List of Reference Symbols

01	-
02	Support plate
03	Printing blanket, rubber blanket
04	Leg (support plate)
05	Printing blanket cylinder
06	Leg (support plate)
07	Center element
08	Fold
09	Fold
10	-
11	End (printing blanket)
12	End (printing blanket)
13	Filler material, support element
14	Filler material, support element
15	-
16	Gap
17	-
18	Support plate
19	Printing blanket
20	-
21	Leg
22	Leg
23	Sealing element
24	Sub-structure layer
25	-
26	Gap
27	Fold

28	Fold
29	Filler material, sealing material
30	-
31	End (printing blanket)
32	End (printing blanket)
33	Cutting line
34	Support element, filler material
35	Center element
36	Support element, filler material
37	-
38	-
39	-
40	-
41	Device, production device
42	Support plate
43	Printing blanket
44	Leg
45	-
46	Leg
47	Center element
48	Fold
49	Fold
50	-
51	Filler material
52	Filler material
53	Base body, support
54	Mold, slide
55	-
56	Mold, slide
57	Adjustment mechanism

58	Device, further, tool
59	Stop
60	-
61	End, printing blanket
62	End, printing blanket
aO1	Distance
a02	Distance
d01	Thickness (printing blanket unit)
d02	Thickness (support plate)
L13	Length
L14	Length
L51	Length
L52	Length
V42	Extension, virtual
V43	Extension, virtual
R	Radius
R03	Radius
R11	Radius
R12	Radius
α04	Opening angle
α06	Opening angle